GARDEN AND FOREST.

PUBLISHED WEEKLY BY

THE GARDEN AND FOREST PUBLISHING CO.

OFFICE: TRIBUNE BUILDING, NEW YORK.

Conducted by . . . . . Professor C. S. SARGENT.

ENTERED AS SECOND-CLASS MATTER AT THE POST OFFICE AT NEW YORK, N. Y.

NEW YORK, WEDNESDAY, FEBRUARY 6, 1889.

TABLE OF CONTENTS.

PAGE.

EDITORIAL ARTICLES:—The Administration of Public Parks.—The Artistic Aspects of Trees. VI. The Lombardy Poplar and the Weeping Willow (with illustration).—Destruction of Timber in Indiana and Illinois 61

Japanese Gardening. II . . . . . *Mrs. Schuyler Van Rensselaer.* 63

NEW OR LITTLE KNOWN PLANTS:—Cereus Pringlei (with illustration) . . . . *C. S. S.* 64

FOREIGN CORRESPONDENCE:—London Letter . . . . . *W. Watson.* 65

CULTURAL DEPARTMENT:—Leaf Spots of Green-house Plants, *Professor W. G. Farlow.* 66

Ferns . . . . . *W. H. Taplin.* 66

Girdling Grape Vines . . . . . *Wm. C. Strong.* 66

Orchid Notes . . . . . *A. D., and F. Goldring.* 67

Propagation of Daphne Cneorum . . . . . *F. L. Temple.* 68

Principles of Physiological Botany. VI . . . . . *Professor George Lincoln Goodale.* 68

THE FOREST:—The Forests of the Rocky Mountains . . . . . *E. T. Ensign.* 69

RECENT PUBLICATIONS 70

PERIODICAL LITERATURE 70

CORRESPONDENCE:—The Mistletoe . . . . . *F. R. D.* 70

Poison Ivy . . . . . *E. Lewis Sturtevant, M.D.* 70

"When to Employ the Landscape-Gardener" . . . . . *Charles Eliot.* 71

RECENT PLANT PORTRAITS 71

NOTES 72

ILLUSTRATIONS:—Cereus Pringlei on the Island of San Pedro Martin, Fig. 92 . . 65

A Willow Walk 67

The Administration of Public Parks.

THERE has, of late years, been a gratifying growth of the sentiment in behalf of public parks in American cities. It is coming to be recognized that a city can hardly possess a more attractive feature than a good system of public parks, and often, even in cities of the second or third rank in respect to population, the foremost talent in the landscape-creative art has been secured to make designs for the great public grounds which, in beauty and in adaptation to their various purposes, can be approached by only a few of the most famous parks of Europe.

When, however, we reflect upon the kind of maintenance our parks receive, the prospect is not cheering. Important works of this kind have been sadly damaged and mutilated, and in some cases almost irretrievably injured, by failure in administration and management. The constant change in our system of municipal government is usually responsible for this. The lack of permanence in administration is our great bane. Lines of policy are entered upon, and after they are well under way they are abandoned at a great sacrifice, usually for no other reason than that they were instituted by another set of men, to whom their successors are opposed on grounds that have nothing whatever to do with the matter in hand. Good housekeeping, either on a municipal or a domestic basis, cannot be expected where there is an unceasing change of servants. The best artist may be engaged to report a project for a public park or system of parks. After a careful study of the situation he submits the plan best calculated to meet the topographical conditions and correspond to the peculiar needs of the population. The plan is accepted, the work is taken in hand, and all goes well for a time, when suddenly the authorities in charge of the work are replaced by other men. This change may come from political motives, it may be due to that spirit of false economy that every now and then pushes forward and aims its blundering blows at precisely the points where they will effect the greatest waste, but a revolution of policy is threatened. Possibly the tact and skill of the artist whose design is imperiled may avert the calamity; there may be a man or two among the new authorities who recognize that, having given a lifetime to the study of such questions, he is most competent to speak, and they are therefore guided by his judgment, and have the character to influence their associates. But the average local politician is not of this stamp. His ignorance is paralleled by his conceit, and he deems himself competent to pronounce with positiveness upon any question presented to him. The danger is aggravated by the prevailing ignorance regarding the purpose of a park. One man has the idea that it must be a centre for all sorts of noisy sports, for festivities of the brass band, fireworks and barbecue order. Another's idea is that of a "pretty" place, a huge flower garden, spangled with gay exotics, striped with ribbon-borders, and beds of brick-colored geraniums uttering their chromatic shrieks on every hand. The true conception of a park—that of a place where the urban inhabitants can, to the fullest extent, obtain the genuine recreation coming from the peaceful enjoyment of an idealized rural landscape, in rest-giving contrast to their wonted existence amidst the city's turmoil—is farthest from their minds, and they will exert all their influence for the incorporation of their favorite discordant features in the scheme. In these ways the purpose of many a nobly conceived public park is threatened with perversion.

How can these defects best be remedied? Of course the greatest safeguard lies in the appreciation of the work by the public itself, for whose benefit the park is created. Once let the design be fully realized, and the public use of the park in the ways originally contemplated would be so thorough, and the enjoyment of it so complete, that any departure from the true purpose would be met by such an expression of sentiment that the desecration would be practically impossible. But, unfortunately, of all art processes, that of landscape-making is the slowest in its consummation, and it is during its successive creative stages that the danger is most threatening.

The landscape-gardener has a task more difficult than that of other artists. His imagination must grasp the available materials and estimate their potentialities, and then, taking a bold leap into the future, he must form in his mind a picture of the ultimate scene to be unfolded, and must dispose his materials so as to develop this ideal through slow natural processes. Besides the ultimate picture broadly conceived so as to present the greatest beauty at all hours of the day and every day in the year, he must also form an idea of the progressive aspects of his creation as the years go on, until the result is achieved, which, with proper care, will endure for centuries. In other artistic activity, realization follows close upon the heels of conception, but the finished picture of the maker of landscapes will not become an actuality for years; indeed, a century may pass before the artist's thought attains its full expression.

The work, therefore, of the true landscape-maker, is essentially unselfish; he can hardly hope to witness its completion, and his only delight is that of conception and of watching its growth so far as he may; the latter activity, akin to parental responsibility, is commingled with pain. Without wide sympathy, a love for the mass of his fellows, a perception of their needs and of how nature can best be brought to respond to them, his task would be a failure. It may be seen, then, that no other form of art-creation deserves more reverent care, more protection from thoughtless or mischievous hands, than that of such a master, whose canvas is the earth, and whose pigments are the objects themselves that the painter aims to counterfeit—the turf, the trees, the grass, the flowers, the rocks, the water, under the changing skies.

The chief danger comes during the progress of the work. The designer, of course, has in view the attainment of pleasing results as soon as possible, and the gradual heightening of these with the progress of the work as the

growing things take shape, although these are incidental stages, and the completed picture may be quite another thing than that out of which it is evolved. But, as in the growth of every organism, there are periods where ugliness temporarily prevails, especially in its beginnings; so it is in the creation of a landscape. In more advanced stages, also, there may be moments when the beauty of the scene might, for the time being, be heightened by making some change in the plan, but it would be at the cost of a lasting mutilation of the whole. To judge a painter's work while it is in progress, and to demand changes, because some effect of underglaze, for instance, that was intended to heighten the beauty coming from succeeding brush-strokes, chanced to be distasteful, would be the height of folly. But in the work of the landscape-maker effects equally transitory are more slow in passing, and are likely to become the pretext for demanding a change on the part of the ignorant or misunderstanding.

Therefore an essential thing in the administration of a public park is to provide some means by which the faithful execution of the original design can be assured. A public park, in order to be well administered, should have a management of the most permanent character possible. In Germany are to be found the best public parks in Europe, and a leading feature of German municipal government is its stability. While the power comes directly from the people, and the form is, therefore, fully as democratic as ours, there is in all departments a permanency of tenure for all officials, from the mayor down, equal to that prevailing habitually in our private business corporations. The result is, a continuedly harmonious administration of public works by competent and experienced men that assures the most economical and satisfactory results.

The adoption of such a system with us would be hardly practicable until experience had taught us the unsatisfactoriness of our present methods by more severe lessons than have yet been received. It seems possible, however, to attain a permanency of park administration in another way. There is an increasing tendency to intrust the management of public libraries, museums and like institutions to boards of trustees, incorporated bodies independent of the city government, but still public institutions sustained by public support. The parks of a city can as appropriately be administered in this way as can a public library or art museum. They form an institution by themselves, sanitary, educational and æsthetic in nature, and it is equally important that they should be kept free from the complications and uncertainties of local politics. The customary park commissions, although often admirably constituted, have the great drawback of a liability to sudden, and, perhaps, complete change of personality. Under such conditions the best results could hardly be looked for, and it is something of a wonder that our parks have been maintained as well as they have. Under well organized boards of trustees, like that, for example, which has built up the Boston Public Library, and has made it the most successful institution of its kind, we might hope for an escape from many of the dangers now attending park administration.

The Artistic Aspects of Trees.—VI. The Lombardy Poplar and the Weeping Willow.

GOOD taste is required for the grouping of all kinds of trees if the results are to have the harmony which is the only quality that, in the long run, can satisfy the eye. But if this is true of trees in general, it is doubly true of those which are eccentric in form or color, like the Lombardy Poplar, the Weeping Willow, the White Birch or the Purple Beech.

No tree has a more marked individuality or is more effective in the right place, than the Lombardy Poplar, but no tree looks worse when wrongly placed. If its constitution were more vigorous it would be well adapted to street planting when the street is narrow, because with it a certain amount of verdure can be secured without too great an interference with sunshine. But the slender shadow it casts renders it, on the other hand, ill adapted for roadside planting where shade would be grateful. Nevertheless, as planted by the highways of Belgium, France and northern Italy it has dignity and beauty. Its stiff, aspiring form brings more accent into such wide, level, featureless landscapes than would the round, umbrageous forms of other trees. This gives no warrant, however, for planting it along winding roads or in mountainous or wooded districts. Nor does it appear well in isolation, unsupported by a long straight line of its fellows or by lower masses of foliage; nor when planted in groups; nor yet when its sharp top is seen rising here and there at random out of a wood. One or two Lombardy Poplars carefully set in a plantation just where they are needed to relieve its general softness and to break the sky-line with a touch of vigor and emphasis, are often most effective. On the border of the lake in the Central Park, not far from its western extremity, are two or three tall Poplars standing on a little promontory. Their effect is admirable, and no other tree in just this spot would have so good an effect. But perhaps the best place of all for the Lombardy Poplar is among other trees beside a low cottage. In many European villages it is thus seen, and in many beautiful pictures it gives dignity and individuality to a composition which, without it, would be tame and commonplace, for the tree is almost as effective in its own little scene as a village spire in the larger scene of which it forms a part.

Wholly different in character is the Weeping Willow, and yet its unusually pliant, drooping expression makes it as conspicuous as the rigid uprightness of the Poplar itself. As soon as it comes before the eye, it presents a striking contrast to the simple dignity of those trees which determine the general character of every landscape. Easy of cultivation, rapid of growth, not particular about soils or situations, and putting forth its leaves very early in the spring; attractive, too, to many eyes by reason of its super-sentimental air, the Weeping Willow has been planted everywhere, and opportunities do not lack, in nearly every country, for estimating its fitness to this situation or to that. Nevertheless, it is hard to say in what situation it looks best. It has not nobility enough to stand by itself, and it does not group harmoniously with any other tree. Once in awhile in a Japanese picture we see a small Weeping Willow planted by a cascade, which has a charming effect. This is because the lines of the falling water harmonize with its own, and because, so to speak, the cascade seems to give the tree an excuse for its abnormal habit. To group it with round-headed trees means contrast without harmony, and this is still more emphatically the case if there is substituted for soft, deciduous foliage, the stiffer, more horizontal forms of conifers. In a street its pendulous weakness conflicts disagreeably with the rigidity of architectural lines; and even when we think a great Weeping Willow looks well drooping over and protecting a rural cottage, we cannot but decide that some other tree would look better, expressing still more clearly the idea of protection through its greater sturdiness. A cottage with a Weeping Willow beside it looks better than a cottage bare of foliage; but an Elm or a Maple of equal size would replace the Willow to very great advantage. But the spot most often chosen for the Weeping Willow is one where it may droop over a stream or a sheet of placid water. Perhaps, however, this is the very place where its faults are most manifest. A Willow is, indeed, very often the best tree that can be chosen for the border of a stream or lake, but not a Weeping Willow. All the virtues of this tree—the delicate character of its spray, the tender, pallid color of its leaves, and their twinkling, airy grace—are possessed by other Willows which are free from its defects. The White Willow of Europe, for instance, now thoroughly naturalized in our Northern States, is much more individual

in color and texture than the Weeping Willow, and is an extremely graceful tree; yet it has great dignity, and harmonizes admirably with almost all the trees commonly planted. A glance at the illustration on page 67, which shows the border of a pond in Brookline, Massachusetts, where White Willows edge the water for a considerable distance, should be enough to prove its appropriateness for such a place, and to suggest that not only near water, but in all other situations where Willows are desired, White Willows or some other species of similar habit should be chosen in preference to the Weeping Willow. Of course, there may be rare cases where a Weeping Willow, especially a small one, has been well used by an intelligent planter; but, as a general rule, it will be found out of keeping with its surroundings. When this is the case, a tree must have extraordinary merits to justify its introduction; and this can hardly be affirmed of the Weeping Willow, which, at its best, is eccentric rather than beautiful, weak rather than really graceful.

A correspondent, who is familiar with the forests of southern Indiana and Illinois, calls our attention to the fact that in this region, which is celebrated for the richness of the forest-growth and the immense development attained by individuals of several species of trees growing upon the deep, alluvial bottom-lands, more clearing and thinning of the woods has been done during the past five years than in the fifteen years previous. A large proportion of the great Yellow Poplars (*Liriodendron*) have already fallen under the axe of the lumbermen. The wealth of these forests will be appreciated when the fact is realized that ten years ago it was not uncommon to find an average of three Poplars to the acre, with stems six feet in diameter and running up straight and clean for a distance of seventy or eighty feet to the first branches. These giants, now nearly all destroyed, grew in a forest in which the predominating trees were Beeches, Black Gums and Blue Ash, which were not surpassed anywhere in stately proportions and splendid vigor.

Japanese Gardening.—II.

I HAVE already tried to show through quotations from Mr. Conder's article in the *Transactions of the Asiatic Society of Japan*, what ideas generally control the formation of gardens in Japan, and have tried to explain that the Japanese considers his garden, with its miniature artificial hills, vales, streams and rock-arrangements, a truly "natural" work of art, because it typifies or suggests by imitations on a smaller scale the effect produced by large natural features. This is to say that the Japanese looks upon this art much as we look upon painting, not demanding that the same materials shall be used as exist in the scene portrayed, or the same scale preserved, but merely that the result shall be truthfully suggestive of something that might be found in the natural world.

Passing to matters of detail, Mr. Conder explains that whether water be actually present or be simulated by expanses of smooth earth or sand, "a garden-lake when constructed in a limited area should never be completely visible from any one point of view, but parts of the outline should be intercepted and hidden by shrubs and plants placed in suitable positions. We find here again the important principle of suggesting limitless space by the partial obliteration of bounding lines." And, it need hardly be said, this idea at least is common to good landscape-gardeners all over the world.

Great use is made of islands in such lakes, whether they be of water or of simulated water. Some of them are isolated from the shore and treated in a way to suggest that they are surrounded by the sea itself. Others are joined by bridges to the bank, and always their minor features have symbolic meanings, which are lost upon a European eye. In a few Occidental gardens great use is made of natural unhewn stones and boulders, but the practice is almost the chief element in Japanese gardening, and great care is given to the sizes and outlines of the separate stones, as well as to their general effect as a mass. "The sizes and proportions of the different stones employed govern, in many cases, the scale of the trees and shrubs used in juxtaposition. Some writers go so far as to say that stones constitute the skeleton of the garden, that their form and distribution should receive the first attention, and that the trees and shrubs should be placed afterwards in such a way as to emphasize and 'support' these stones and connect them into one harmonious whole." Scale is nicely regarded—very large stones are not used in small gardens, nor small stones in large ones. "The principal boulders in an artificial landscape being arranged to represent natural rocks, it is often customary to describe their altitude by fictitious measurements applicable to the grandeur of real scenery. This custom not only helps to keep up the imaginary illusion, but no doubt assists the designer in a consistent preservation of the character of all subsidiary parts. . . . The chief thing to be kept in mind in arranging garden-stones is to make them appear as if Nature had placed them in position. Some of the wilder freaks of Nature must, however, not be copied, for if artificially imitated on a comparatively small scale, they would be suggestive of instability and danger, and destructive to the general repose required in an artistic composition. It is the immensity, antiquity and adamantine solidity of the overhanging rocks and towering pinnacles of natural landscape which reconciles us to their threatening appearance." How different indeed are such ideas as these from the ones that commonly direct the employment of stones in our gardens, where no thought of Nature is suggested by the rockeries, grottoes and palpably artificial cascades, and where beauty has seldom been considered in the choice of the elements of construction.

A long list of stones is given by Mr. Conder, each of which is considered appropriate to a given service—as for association with water, or for use in valleys or on mountains or beside roads—and each of which has its own symbolic significance besides. The use of turf in Japanese gardens, he says, is of comparatively recent introduction. "The level portions were formerly finished in beaten earth, kept carefully weeded, or spread with white sand or broken shells. The hills were partly covered with different kinds of green moss." Raised stepping-stones often traverse these earthy lawns, and they are kept a little damp for the sake of neatness and coolness. Or if sand is used, it is carefully raked, sometimes in patterns—as in waving lines that represent water. "Gardens consisting of such areas of naked raked sand, with only a few stones representing rocks and islands, are not uncommon." How little they would satisfy our taste! Yet the strong Japanese imagination can delight in the picture of a sea-coast or mountain-lake which they present.

"In connection with the temples there are many magnificent avenues and groves of fine trees, arranged with the same formality as is employed in Europe. Some of the avenues of Cryptomeria and of 'Enoki' (*Celtis Chinensis*) lining the country roads and temple approaches are hardly equaled in grandeur by any avenues in the West. But in landscape-gardening such arrangements are seldom, if ever, resorted to. In cases where trees are grouped together in numbers, they are generally of different species and specially selected to contrast with one another. Form and line receive primary attention. . . . Such contrasts as that which the rugged Pine, with its scrambling, angular branches, forms with the spreading Cherry, or the drooping Willow, with its curving boughs, are purposely designed. . . . Trees and plants should not be used in positions contrary to their natural habits of growth. For example, a hillside plant should not be placed in a valley, nor should plants peculiar to low, sheltered spots be placed on high ground." Here again is a refinement quite foreign to Occidental gardening, which prides itself, rather, upon making plants grow in just those situations where nature had not placed them. "As a general rule, trees which shed their leaves and look bare during the winter should not be planted in the foreground of a garden. An exception . . . is in the case of the Plum tree, which, on account of its early blossoms, is placed in the front of the grounds."

"The habit of clipping and shearing trees and shrubs is a common one in Japan, but it is seldom done in a manner inconsistent with the general character of the particular trees thus dressed." What the gardener aims at, is to accentuate, not controvert, the design which nature had in forming a particular tree. The Pine, for example, "goes through a thorough surgical treatment in the nursery, with the idea of producing a shape of acknowledged beauty, as displayed in some of the finest natural trees. Its branches are bent, broken and bandaged, and bound with cords and splints, until it grows into the fancy shape desired." This shape is rarely at variance with forms that can be found in nature; yet dwarf trees are sometimes trained into curious, non-natural forms, the branches of the favorite Pine are occasionally cut into the form of balls and trained to grow in a pendant way, suggestive of a cascade, and now and then one may even see a shrub cut into the shape of a junk under full sail. But fantasies like

these, we gather, are executed on a small scale and not placed where they would disfigure a landscape effect. Low shrubs are generally cut into hemispherical forms, but this is to aid the imagination by representing "rounded masses of variegated greens placed upon the hillsides and between the rockeries. . . . Such spherical masses are frequently arranged in groups towering one behind another, so as to suggest the forms of green hills." That is to say, the eye then recognizes, not an artificially shaped shrub, but a mass of larger size seen at a fictitious distance.

In the placing of trees, great care and taste are, of course, displayed. They should stand near a veranda for the purpose of affording shade, and near bridges so that their shadow may fall upon the surface of the water and produce a pretty effect. Singular and suggestive names are applied to the trees which hold different positions in a garden, from the principal tree which occupies a foreground spot, and must be a large and fine specimen—usually an Oak or a Pine—to the "distancing tree," which must stand behind the furthest hill of the garden and be rendered indistinct in outline to aid the effect of remoteness.

Flowering trees are often massed together in large numbers in public gardens; but in private grounds, where a more delicate taste may be supposed to rule, they are preferably distributed "in such a way that they shall come between the foliage of evergreens." Flowers are profusely used in most gardens in such a way as to supply an abundance of color at all seasons of the year. But in some kinds or types of gardens they are absent or appear only in or near the water. Of course no landscape arrangement is disfigured by formal beds; but another part of the grounds, usually adjacent to the women's apartments, is often devoted to the flower-garden, and here the plants are thickly massed together, though without any attempt at geometrical pattern-making. The growing of flowers in this way is, however, regarded as a rather effeminate taste.

Many paragraphs in Mr. Conder's article are devoted to the lanterns which so prominently ornament Japanese gardens, and to the nature and arrangement of gateways, fences, water-basins, bridges and hedges, as well as to the kinds of trees, shrubs and flowers most generally seen. But there is no space here to follow his descriptions. It can only be added that, of course, the arrangement of hills and valleys described in my former article does not universally prevail. The so-called "Common Gardens" have no artificial hills, "but the stones and rounded shrubs are sometimes grouped so as to suggest mountain scenery. . . . Gardens of this type when level may be supposed to represent either a mountain-valley or a sea-beach; in the former case the surroundings should be steep, thickly planted and imposing; in the latter case the landscape may be open and placid." Gardens for tea-ceremonies have peculiarities of arrangement proper to themselves, and there are others in which a stream is the chief feature, and which are arranged so as to bring it to the best effect. Even narrow courts and passages are treated by the landscape gardener, in simple designs consisting of "a continuous row of stepping stones and an occasional group of trees and shrubs."

And in conclusion I may add that a compensation is found in Japan for that lack, which Mr. Conder notes, of large parks with roads, wide lawns and great plantations, such as we find in the West. Wherever one goes in Japan, we learn from other writers, the natural landscape has been touched up and assisted to greater beauty by the hand of man. One can never tell where nature ends and artificiality begins, so thoroughly have nature's intentions been respected and so artistically have they been developed. Where a real landscape is thus treated, of course no miniature simulations of scenery are introduced. These are reserved for spots apart from great natural features, although such features may afar off encircle them and blend with their own near beauties. Here they lie, like pictures in a frame, and as such are judged by the Japanese eye—less for what they are, though this may be something very charming, than for what they typify, suggest and stimulate the imagination to recall.

New York. *M. G. van Rensselaer.*

"When you come upon a particularly fine prospect, and remark upon it, What a pity that great tree is there, how much finer this would be if it could be removed! you might be very much surprised to find, when the tree was cut down, that you no longer had a picture before you; for the highest type of garden is like a picture gallery and pictures require frames." *Pückler-Muskau*, 1834.

New or Little Known Plants.

Cereus Pringlei.

ONE of the most interesting of Mr. Pringle's numerous Mexican discoveries is the great Cactus which now bears his name,* and which he found during the summer of 1884 growing upon the hills and *mesas* south of the Altar River in north-western Sonora.

The stems of this remarkable plant, which divide irregularly above the base into numerous large branches, do not attain the great height of its near relative, the now well-known *Suwarrow*, the *Cereus giganteus* of Arizona and Sonora. They are sometimes, however, more than thirty feet high, and they are thicker and more ponderous than those of any Cactus known. The number of ribs is fewer than in *C. giganteus*, while the flowers, instead of being clustered about the summit of the stem, as in that species, are scattered along the ribs for a distance of two or three feet from the top.

Nothing more was seen of this plant until October, 1887, when Dr. Edward Palmer, the well-known explorer of Mexican botany, visited San Pedro Martin Island, in the Gulf of California, which he found covered with a forest of these trees, which our illustration upon page 65, taken from a photograph, for which we are indebted to Dr. Palmer, shows to be one of the strangest and most remarkable forests which has yet been seen in any portion of the North American Continent.

It appears from Dr. Palmer's notes that San Pedro Martin Island, is in the Gulf of California, eighty miles northwest of Guymas, in latitude 29½ and longitude 113 west from Greenwich. It is an irregularly shaped rock about four and a half miles in circumference, with a central elevation of 1,200 feet above the level of the gulf. It is partly covered with a deep deposit of guano, which Mexicans and Yacqua Indians are now engaged in collecting for export. The Cereus is called *Cordon* by the Indians, who gather the fruit in great quantities. They take out the pulp and seeds and grind them together into a sort of flour. This is then mixed with water and made into *tomales*, or cakes, a tablespoonful of the paste being put between two corn husks and boiled. Dr. Palmer found these *tomales* not inferior to the pies of more civilized people.

The Cordon furnishes the only fuel and timber produced upon the island, which is destitute of other trees. The dry, hard ribs, the remnants of many forest generations, and practically indestructible except by fire, are found scattered over the surface in large numbers; they are carefully collected by the Indians, who manufacture them into the canes needed by the men in climbing over the precipitous rocks in search of the guano; they serve for the beams and door-posts of the workmen's huts and supply the fuel for their simple cooking. The largest plant observed by Dr. Palmer was thirty-five feet high, with a circumference at the base of the trunk of seven feet and six inches.

Dr. Palmer collected only eighteen flowering plants upon the island; among these Mr. Watson finds a new genus of *Compositæ*, and a bushy Fig, probably an undescribed species. The poverty of the collection is due in part, no doubt, to the late period of the year in which it was made, and when most annual plants would have entirely disappeared. *C. S. S.*

* "*Cereus Pringlei*, Watson, *Proc. Am. Acad. Arts and Sci.*, xx. 368. Stems erect; ribs usually thirteen, very rarely more; areolæ contiguous upon the ribs, oblong or lanceolate, the younger densely tomentose and with an outer circle of nearly erect, more or less unequal, ash-colored spines (mostly six to nine lines long), and a central stouter one twice longer, all terete; the older areolæ naked, with about fifteen dark flattened spines, mostly widely spreading, about an inch long, and deciduous; flowers lateral and scattered below the summit of the stem, two and one-half inches long; the ovary and tube very densely covered with tawny hairs, nearly or quite concealing the lanceolate scales and outer sepals; petals spathulate, white, tinged with green or purple, six lines long; fruit globose, two inches long, bearing the persistent flower, and densely covered with globose cushions (four or five lines in diameter) of dense tomentum intermixed with more or less numerous white, bristly spines (one-half inch long or less); seeds black and shining, obliquely oblong-ovate, one and one-half lines long; hilum oblong, basilar."

Foreign Correspondence.

London Letter.

THE new plants of 1888 do not include anything of a sensational character. There are a great many Orchids, numerous hybrids of all kinds, and a few introductions of a miscellaneous character. But one cannot point to any of them as of very exceptional merit. The taste and demand for Orchids predominates over everything else, and, no doubt, has diverted the attention of collectors from other plants. Indeed, there are those who affirm that it does not pay to bother about introducing anything nowadays except Orchids, which is another way of saying that there is no demand for plants of other families. But a new plant of superior qualities for the garden is always certain to find general favor. As an instance I might point to *Impatiens Sultani*, which was introduced to Kew by accident a few years ago, and which is now in almost every garden. *Aristolochia elegans*, *Boronia heterophylla* and *Nephrolipis rufescens tripinnatifida*, all introduced through Kew within the last five years, are also universal favorites. A large number of new plants are obtained through cross-breeding, and these absorb a good deal of the attention of horticulturists. There must be large numbers of beautiful plants still unknown in gardens. Even those fields which have already been explored by the collector will contain many good plants worth introducing, whilst such new countries as New Guinea, Madagascar and Burmah are sure to be rich in floral treasures of all kinds.

Fig. 92.—Cereus Pringlei on the Island of San Pedro Martin.—See page 64.

Last year's introductions comprise numerous Orchids, most of them interesting, a few beautiful, the best of them being the following: *Cypripedium bellatulum* (habitat not published), introduced by Low & Co.; *C. Elliotianum*, from the Philippines, and *C. Rothschildianum*, from Papua, both by Sander & Co.; *Spathoglottis aurea* (*Kimballiana*), Borneo; *Lassochilus giganteus*, Angola, Linden; *Disa racemosa*, South Africa, Kew.

Amongst stove plants there are none of any particular beauty, the most distinct and pretty being *Begonia Lubbersii*, from Brazil. There is no new green-house plant, and only the following first-class new additions to the herbaceous collection: *Lilium Nepalense*, Nepaul, Low & Co., and *Ostrowskia magnifica*, Turkestan, Max Leichtlin. Two good, hardy flowering shrubs have been added. These are *Styrax Obassia*, Japan, Veitch & Sons, and *Stuartia Pseudo-Camellia*, Japan, Veitch & Sons. [The last named plant has been known in American gardens for the last dozen years.—ED.]

When we come to varieties of well-known plants, however, we find a long list of new additions, many of them decided acquisitions. Especially is this the case in regard to Orchids. It may be treasonable to say so, but is there not too much importance attached to the mere marking and size in the flowers of these plants?—a great many being dubbed varieties and distinguished by a three-barreled name on account of characters which in any other family of plants would be ignored. Plant-breeders contribute more than any one to the progress in the horticulture of to-day. It scarcely seems credible that a generation or so ago many botanists discouraged with all their might any attempt to tamper with the so-called specific characters of plants by crossing them. Darwin taught how important a light the work of the breeder of plants, as well as of animals, throws on the great secret of the origin of species. Nowadays almost every nurseryman in England tries his hand at crossing one species of plant with another. The result already is almost miraculous. Among stove and green-house plants we have Orchids, Nepenthes, Begonias, Crotons, Anthuriums, Caladiums, Rhododendrons (Javanese), and Hippeastrums; hardy plants may be instanced by Hellebores, Pæonies and Narcissus. It is remarkable that none of these crosses, however extreme, reveals any tendency on the part of the offspring to break away from the fixed characters of the genus. Another fact of equal interest is that no cross-breeding of species, however varied in character the different species crossed are, has produced anything more extraordinary than has been obtained by the cultivation and selection of the progeny of a single species. The Chrysanthemums, with their hundreds, thousands of forms, all from one species, according to some botanists, the Gloxinias, the Cabbages, Apples and many other well-known garden races, are cases in point. Certainly the breeding of plants is a most delightful and fascinating occupation. It is as yet in its infancy, but in England it is being pursued with zeal and patience, and the magnificent results already achieved point the way to still greater.

An exhibition of Chrysanthemums on the tenth of January is a novelty which a few years ago would have been considered absurd. But by dint of careful cultivation and the selection of late-flowering kinds a very creditable display was collected in the London Aquarium on that date. The kinds shown were the following: Belle Paul, Meg Merrilies, Gloriosum, Rolfe Brocklebank, M. de Cairol, W. E. Drover, Progne, Martha Harding, Golden Gem and Mrs. J. H. Jones. During the last month we have had very heavy and continuous fogs, which have damaged flowers of all kinds, Chrysanthemums included. Still the above display was most interesting, and is certainly a step in the right direction. There does not

seem any good reason why we should not have Chrysanthemums that flower from January to June, just as we have them now from July to January.

Growers of hardy plants here are turning their attention again to Hollyhocks, which a few years ago were as great favorites as Single Dahlias are now. Then came disease, and the stately, many-colored Hollyhock was almost given up in despair by English horticulturists. Modern growers say cow manure will keep away the disease from these plants.

January 11th, 1889. *W. Watson.*

Cultural Department.

Leaf Spots of Green-house Plants.

IT is usually the case, when black spots appear on the leaves of ornamental plants, that they are supposed to be due to the attacks of insects or the growth of fungus parasites. There is, however, one form of black spot to which my attention has been several times called, which, although due to a fungus, is not caused by a parasitic species which infests the leaves themselves, and the spots cannot be considered as indications of any disease, but merely as accidental disfigurements. The spots to which I refer are about as large as the head of a pin, and are scattered without order, and sometimes very profusely, over the surface of the leaves. They can easily be removed by mashing or be picked off, when they leave a slight circular depression, as a rule. A microscopic examination shows that there is no fungus mycelium, but merely a mass of ellipsoidal, orange-colored cells covered by a black, structureless membrane of a flattened, hemispherical shape, which adheres to the leaf by its free edge. In short, the black spots are nothing but the discharged spores of a species of Pilobolus with their sporangial cap.

The species of Pilobolus are small moulds which grow on dung of various kinds, and look like minute white or pale orange-colored, glistening sacks, with a black tip when mature. The spores are ejected with considerable violence, and I have known them to be shot off to a distance of several feet. It is only when the Pilobolus grows on the manured soil of hot frames and green-houses, or other small-sized compartments where plants are grown, that it is likely to attract popular notice. When plants are crowded in a small space over fresh manure the Pilobolus is likely to appear and discharge its spores over the leaves and stems of any plants which are near. Some years ago the Roses in a green-house at Cleveland were found to be thickly spotted with Pilobolus spores, and the black spots were supposed to be due to a new fungus disease. More recently the Roses in a small green-house at Whitinsville, Massachusetts, were similarly affected, and an examination showed the presence of a quantity of Pilobolus, whose spores not only formed spots on the Roses, but also on the wood-work of the green-house for a considerable extent. The most recent case to which my attention has been called was at Newton, Massachusetts, where the leaves of Geranium were thickly spotted by spores of Pilobolus. The spots, of course, are merely a form of dirt, and cause no disease of either Roses or Geraniums, for the Pilobolus spores do not develop on living leaves and stems. It is a little singular that, while this particular form of black spot has attracted the attention of gardeners in this country, it has not been noticed in European green-houses either as a supposed cause of disease or disfigurement to any extent, if one can judge by the absence of any reference to the subject in the common works on plant diseases. *W. G. Farlow.*

Cambridge, Mass.

Ferns.

DURING the dull days of mid-winter it is essential that sufficient ventilation should be given to this class of plants, for if the moisture in the atmosphere is condensed on the fronds to any great extent, the plants soon become disfigured. If the weather is severe, a little additional fire-heat may be given, so that the ventilators may be opened enough to allow the superfluous moisture to escape, though at the same time excessive firing should be avoided, the present being the season of rest for a majority of species.

Some judgment should also be exercised in the matter of watering, so that the deciduous kinds may receive no excess, which would be sure to injure their roots, and this would mean a weakened growth the following season. Of course the evergreen species will take much more water, and, in fact, should not be allowed to become actually dry at any time during the year.

These cautions are specially applicable to old-established plants, as young seedlings of many species can be readily kept in a growing condition during the first year, or possibly eighteen months, of their existence, but the period of rest will become more marked during the second year. As the most suitable time for repotting most of the species will soon be upon us—that is, in February or the beginning of March—it may be well to give that matter some consideration here. In repotting some of the large plants, it will be found more convenient to reduce the old ball, so that the plant may be replaced in a pot of the same size, provided this operation can be done before active growth begins. Otherwise the result might prove a disappointment; and if necessary to increase the stock, division of the crowns or rhizomes, as the case may be, can best be made at the same time. The soil for potting should be rather coarse, but the plants should be potted firmly, and given free drainage, though until they begin to root freely water should be given rather sparingly, not allowing them, however, to become very dry.

The practice followed by some growers, of cutting off all the old foliage at the time of repotting, may not be very injurious to some species, and if the plants are infested with insects it is a very good way of disposing of much of the vermin; but in my experience this radical treatment has not proved entirely satisfactory, on account of the weaker growth resulting from it, so that the plants recover their beauty much later in the season than when a portion of the old growth is left until the new appears.

If it is desirable to raise some plants from spores, these may be sown at any time when they are ready, but the most successful sowing is usually that made about the beginning of March. After that time there is not so much danger of the young plants damping off, and being the natural season of active growth with many of the species, it is quite reasonable to suppose that they will make more rapid progress if sown at that time than at any other.

But apart from the economic side of the question, the raising of Ferns from spores will be found a most interesting diversion for any one so inclined, not only on account of their peculiar mode of development, but because novel forms and unexpected hybrids often appear in a collection of seedlings.

Holmesburg, Pa. *W. H. Taplin.*

Girdling Grape Vines.

ON the 13th day of September last an excellent opportunity was afforded to a Committee of the Massachusetts Horticultural Society to observe the effects of the process of girdling the branches of the Grape for the purpose of hastening the maturity of the fruit. Among other vineyards, we visited one situated in the south part of the town of Concord. On the southern slope of a hill which runs down to the river we found a plantation of several acres of the Concord Grape. The elevation was about seventy-five feet above the level of the river. The plants in the eastern half of the vineyard had been girdled for this and the two preceding seasons, while those in the western half were growing in their natural way. The girdled plants were more irregular and thinner in foliage, and, upon general view, did not look as vigorous as the normal growth. A closer inspection showed that the girdling process had been severely practiced upon every fruit-bearing branch, producing a very marked effect in developing the size and hastening the maturity of the fruit. Though the season was so late and unfavorable that we found the Moore's Early, in this and in other vineyards, to be barely ripe, yet the girdled Concords were in quite as good condition. On the other hand, the Concords of normal growth were much smaller in size and hopelessly behind time. It was evident then, as the event proved, that the natural crop would be ruined by frost. Here was an instance of a crop saved by girdling, and of another, side by side, which was lost by neglect of this process.

Without going further, it is then evident that, under some circumstances and with some varieties, there are decided advantages in the process. Such excellent varieties as the Iona and the Jefferson may be hastened to maturity by girdling. But in ordinary seasons we should scarcely think it worth while to be at the trouble to hasten the Concord, when we have equally good varieties like the Worden and the Moore, which are early without this treatment. Yet there is a larger development of the fruit by the process, which is of much importance to the marketman. This is so material a consideration, that it would be likely to govern were it not for another consideration which must be taken into account. What will be the permanent effect upon the vineyard of a continuation of this process? In the instance before us the work had been so thorough, not to say severe, that the effect upon the future of the vine could be predicted with confidence.

Not only were the branches above the ring largely developed by the arrest of the descending sap and also the limbs below seemingly shrunk to the size of a pipe stem, but the renewal-canes appeared to have an enfeebled growth. It was evident that the saving of the crop was likely to prove a serious injury to the health of the vineyard. But this was an extreme practice, where the crop had evidently been treated as of prime importance, and the renewal-cane had been neglected. But this by no means determines whether a judicious use of this method may not often prove harmless and of great practical advantage. Our native Grape is so superabundant in the production of foliage that checking becomes necessary. The fact, also, that a large amount of old wood has to be removed every autumn, has a bearing upon this question. Add to these the consideration that the renewal-cane, under proper encouragement, will give a large supply of nourishment to the root, and it does not seem unreasonable to conclude that a moderate portion of the descending sap may be arrested just below the fruit without material injury to the vine. Indeed, the case which has been here cited, and many similar ones which are known, so far from disproving, rather go to prove that a well-considered and moderate girdling would often result in decided advantage. At all events, it is desirable that there should be continued experiments in this direction.

Newton Highlands, Mass. *Wm. C. Strong.*

A Willow Walk.—See page 62.

Orchid Notes.

Cœlogyne cristata.—This is one of the most popular of all the white flowering Orchids, its blossoms being pure and very handsome. It made its appearance in European gardens nearly half a century ago and has always been greatly admired. Several varieties have flowered since its introduction, among them being the very rare *C. cristata alba* (*hololeuca*), with blossoms of the clearest white, and now only to be seen in select collections. Two other varieties, one called the Chatsworth variety and the other known as *C. cristata maxima*, are both large forms, the latter having broad, flat sepals and petals, and a large lip with a bright, golden-yellow crest. This also remains somewhat rare. In its native country it is found growing at an elevation of 6,000 to 8,000 feet above sea level, and where the atmosphere at all seasons is very cool. Large specimens of this Cœlogyne are often met with, a fact which clearly indicates it to be a species of easy cultivation. When growth commences the plants should occupy a cool situation until the newly made bulbs are fully matured, after which they should be removed to the warmest end of the Cattleya house as near the light as possible, and during the months of December and January, when Orchid bloom is always welcome, large, bold blossoms of ivory whiteness and of good substance will develop themselves very rapidly and remain in good condition for several weeks.

Dendrobium Wardianum.—This is a winter blooming species, and its very free flowering qualities, combined with its easy culture, make it a most desirable Orchid. It is deciduous, and succeeds best at the warmest end of the Cattleya house, close to the light, either in pots or baskets. It does not enjoy too much pot room, its thin, aërial roots preferring the outer surface of the pot or basket which it occupies. When the growths are fully matured the plant should be removed to a much cooler and drier atmosphere, enough water only being given to keep the bulbs from shriveling. About the end of September and beginning of October the plant may be removed again to its blooming quarters, when large and very handsome blossoms, each measuring some three inches in diameter, will make their appearance almost the entire length of the pseudo-bulbs, during December and January, and remain in good condition for from four to six weeks. Imported plants of this Dendrobium arrive in the market during February and March and are easily established. With good drainage and very little potting material, they will yield quite a display of bloom the following winter. *A. D.*

Short Hills, N. J.

Phalænopsis denticulata is a new species, flowering for the first time with us. It evidently belongs to the Sumatrana section, though robust in growth. It bears short, erect, few-flowered racemes; these are yellowish-white, barred and blotched with cinnamon brown; the lip is streaked with violet, the anterior lobe white and papillose. It grows very freely with us, extending its roots in all directions, delighting in abundance of water and strong heat.

Saccolabium giganteum.—This is a beautiful Orchid introduced from Burmah. It is easily grown and of robust habit, with an erect, stout stem, closely clasped by broad, lovate leaves about one foot long, dark green, with streaks of lighter shade. The flowers are produced on dense racemes, about a foot long and pendulous. They are pure white, speckled and blotched with amethyst. The lip is amethyst, with lines of a lighter shade. This plant is probably only a variety of *S. violaceum*, a species introduced more than a century since under the name of *Vanda densiflora*. In the latter the leaves are narrow and longer, while the flower is of a mauve violet on a white ground. A pure white variety of this is called Harrisonianum, and is somewhat rare. All of these

plants do best in baskets filled with sphagnum and large lumps of charcoal in the warmest house, with abundance of water at all seasons, not allowing them to become dry at any time.

Kenwood, N. Y. *F. Goldring.*

Propagation of Daphne Cneorum.—This beautiful shrub has always been comparatively scarce, on account of its slow and somewhat difficult propagation by ordinary methods. To multiply it rapidly the following method has been successfully practiced: remove two or three inches of the soil about and among some strong plants, in open ground, in spring, and fill in carefully with very fine compost, almost to the tops of the branches, leaving, perhaps, two inches of their tips above the surface. This will necessitate, also, careful pegging down of the plants.

The next spring, just as soon as the frost is out, remove with the nicest care the compost, using a hose or a pail of water to wash away the soil from the thickest part of the bush, and there will be found multitudes of little white buds on the branches, each standing out from the surface of the bark like an excrescence, only held to the parent plant by a minute thread, and each bud supplied with a straight, white root, the whole looking like a seed of Clover when well sprouted, but still below the surface. This Daphne has a great many leaves on its branches, and in the axil of each one is a dormant bud. These minute buds rarely develop under ordinary circumstances; but the generous diet prescribed above causes many of them to push, in their cool and dark situation, into the shape described.

These miniature plants come to the surface and develop into strong and really independent plants, wherever they happen to receive enough light and space to encourage them. But the greater part would be smothered by the shade or crowded out, if unassisted. All that remains to do is to detach them carefully from their native stem, which the least touch of a fine point will accomplish, and plant them immediately in a prepared soil, fine but not too rich, in small pots or boxes, and to keep them in a cool part of the green-house, or in a frame.

One plant, three feet across, so treated, produced last season, in the nursery, over 1,000 of these young plants.

Somerville, Mass. *—F. L. Temple.*

Principles of Physiological Botany, as Applied to Horticulture and Forestry.

VI.—Appropriation of Carbon, or Assimilation.

FROM the previous papers in this series the following facts must be briefly cited: (1) The parts of the plants are perfectly continuous, and there exists an unbroken connection between the leaves on the minor divisions of the branches and the hairs on the ultimate divisions of the roots. (2) That all the active parts of the plant are impregnated with water, and so long as the loss by evaporation from the leaves is made good by receipt of water from the soil, the tissues remain unwilted. (3) By evaporation of water from the leaves, the dilute solutions taken in by osmose through the root-hairs are concentrated. (4) That the active cells throughout the plant require, for their activity, oxygen and food.

We are now to inquire in what way the plant prepares for itself this food which is essential to its activity. The question will be simpler if we look first at the mechanism of the food factory itself, the green leaves and other green tissues exposed to light, afterwards considering the materials out of which the food is made.

Each green leaf consists of a framework made up of mechanical elements imparting strength to the fabric. This framework gives us the innumerable diversities of veining of leaves, and their distribution governs largely the shape of the leaves. Supported by the framework are the active cells by which the food is prepared. In most cases these are not closely packed together, but they have between them intercellular spaces of greater or smaller size. Over the whole is extended the delicate epidermis, with its breathing-pores, previously described. The active cells contain not only protoplasm, but also green plastids or chlorophyll-granules. The pigment which gives to these their characteristic color possesses peculiar optical properties, chief among which is that of modifying the refrangibility of the rays of light, so that all the so-called violet, indigo, blue, green and yellow rays are bent from their course, and appear as red rays. Again, the color of an alcoholic solution of this pigment, which by transmitted light is green, appears blood-red by reflected light.

By gaseous diffusion the gases of atmospheric air make their way through the epidermis, and come, in a dissolved state, into contact with the protoplasmic matter and the green granules which it contains. In the atmosphere there is found, in very small amount, the gas known as carbon-dioxide. This gas and the water from the soil are the principal raw materials used in the manufacture of food. Formerly the amount of carbon-dioxide in the atmosphere was stated to be about four hundredths of one per cent., but recent investigations have placed the figure somewhat lower, or about three one-hundredths of one per cent. This incredibly small amount is the source of all the carbon which we find in the organic world. It is first appropriated by the green granules under certain conditions about to be noticed, and, once appropriated, its combinations undergo myriads of transformations, both in the vegetable and animal kingdoms.

The conditions for the appropriation of carbon by plants may be given in the following order: (1) A supply of carbon-dioxide adequate in amount, but still not largely in excess of what the plant naturally finds around it in our atmosphere. It is generally believed that at certain periods in the geological past the amount might have been somewhat larger than that which we find at present. It is not, however, necessary to hold that the percentage was very much greater, in order to account for the enormous accumulations of vegetable matter transformed into coal during the carboniferous period. Botanists think that plants obtain the carbon-dioxide directly from the atmosphere, and all the experiments upon the subject justify that conclusion; but it seems unlikely that plants are unable, under any circumstances, to obtain a certain portion from the soil. The late Professor Gray believed that plants possess the power of taking up some of their carbon-dioxide through their roots, but he frankly said, that as yet we have no actual proof that this is the case.

(2) The second condition for the appropriation of carbon is the presence of chlorophyll granules in active protoplasm. Protoplasm without these granules (or their equivalent, like that found in certain sea-weeds), does not have the power of effecting the change by which carbon is retained. Again (3), there must be exposure of the cells to light of proper quality and intensity, such as that furnished in the sun's rays. It is not necessary, for experimental purposes, that the light should be direct or diffused sunlight, for some of the common artificial lights answer, notably the brilliant electrical lights now in use. But, of course, in its ultimate analysis, all of these artificial lights are only sunlight more or less removed from its original source.

Lastly (4), the active cells must be kept at a certain temperature. The degree of temperature most favorable for most rapid appropriation of carbon is different for different plants, but, in general, it is not far from 85° to 90° Fahr.

When these conditions are provided, the manufacture of food proceeds with greater or less rapidity, the rate depending on certain minor factors. Its chief feature is the reduction of the carbon-dioxide in the presence of water by the elimination of a certain proportion of the oxygen of these two substances, amounting practically to that which the carbon-dioxide holds in combination. This oxygen is set free from its combination, and, for the most part, escapes from the plant.

We do not know positively what the resultant combination of carbon, hydrogen and oxygen is, but it is probably one of the simplest carbohydrates, capable of immediate transformation into other substances. It is easy to show that, under certain circumstances, a part of this food is changed into starch, even in the chlorophyll granule, and there held in its solid form. But the greater part is taken away from the source of manufacture and stored in some shape for immediate or for future use. A large portion of this food is changed at once into the permanent form of cellulose or cell-wall substance. Portions are changed in the laboratory of the plant into the numerous substances characteristic of the vegetable world, such as tannin-like matters, and so on. And since all these substances formed from inorganic matter are like plant-substance, the term assimilation has been applied to the process by which they are formed. But, lastly, a certain part is consumed at once in work; combining with oxygen, it is, so to speak, burned up in doing the proper work of the plant. This proper work of the plant—its lifting and growth, its transfers of material and the motions of its parts—must be regarded as very small when compared with that which is done by sunlight in the plant. This can be illustrated by giving an approximate estimate of the amount of carbon which plants accumulate during a given time. This accumulation expresses, of course, the amount of work done by the sunlight in breaking up carbon-dioxide, less the amount of food broken up by the plant in its own activities. The difference is well seen when we take an acre of forest and estimate its annual increase in carbon. This is about the same as that accu-

mulated by an acre of herbaceous plants, or of shrubs—namely, about one ton, or more nearly 2,600 pounds, of carbon.

This ton of carbon to the acre represents, when expressed in the terms of modern physics, a certain amount of "energy of position" derived from the transformed "energy of motion" of the solar radiance. In this state it is ready upon occasion to give forth again as energy of motion its energy of position. It is a wound up spring, a raised weight, a bow upon the stretch.

This ton of carbon to the acre represents, when expressed in terms of modern chemistry, the product resulting from the reduction of a highly oxidized substance—namely, carbon-dioxide. In this new form it is ready to undergo oxidation and to return thereby to the inorganic matters from which it was produced in the mechanism of the plant through the agency of the sun's rays.

When we reflect that the carbon-dioxide from which this carbon is derived exists as what is practically an impurity in the atmosphere, irrespirable by animals, and that after its abstraction from the atmosphere there is given back to the air the oxygen which is required by all organic beings for their respiration, some of the intimate relations between animals and plants become very clearly seen. Not only do plants prepare food for animals, but they produce it from matters which are deleterious to animals, giving back in this very process the oxygen which the latter need in large amount.

To those who are fond of looking at the organic world as a product of development from very simple beginnings, these relations between plants and animals are among the most interesting subjects for speculation. Animal life cannot exist under its present restrictions as regards food, without the aid of plants; hence, plants must have preceded animals in the order of succession. But if we take into account the fact that there are a few of the lower animals which are believed by some observers to have the power, by means of a certain amount of chlorophyll which they have in their composition, to act upon inorganic matter precisely as plants do, the question of development becomes all the more complicated and interesting. These exceptional creatures, if their life history has been rightly understood, share capacities belonging to both the animal and vegetable worlds. But it must not be forgotten that without the distinctive chlorophyll (or its active equivalent), the living matter of the organism which we call a plant has the same needs as that of the animal. In fact, large groups of plants, among which may be mentioned the Mushrooms and Moulds, are illustrations of this very fact; they cannot prepare food for themselves, but must have it prepared for them by other plants. In many cases, of course, this food may, through its consumption by animals, have passed through many changes before it is presented for the parasitic plant to consume; but these cases only serve to emphasize the general statement, which may now be repeated in concluding this paper: green plants produce all the food which they themselves and animals require. The apparently simple and yet exceedingly complicated process by which plants prepare from inorganic material the organic food demanded by all organisms, transforms inorganic matter into substance like the very substance of the organisms themselves, and hence the term assimilation is highly significant.

Cambridge, Mass. *George Lincoln Goodale.*

The Forest.

The Forests of the Rocky Mountains.

IN a paper on "Rocky Mountain Forests," read at Atlanta before the American Forestry Congress, Colonel E. T. Ensign, of Colorado, estimated the forest-land in Colorado, Wyoming, Montana, Idaho, Utah, Arizona and New Mexico at about 95,000 square miles, or thirteen per cent. of the entire area. This includes, he said, all grades, light and heavy, valuable and inferior. The forests are mainly coniferous, and most of them are on the mountain slopes, from 4,500 to 12,000 feet above the sea. Some of the foot-hills and mesas have a scattering and inferior forest-growth, and many of the streams are bordered with Cottonwood and a few other deciduous trees. Large tracts in the mountains from which the evergreen forests have been burned are now covered with the Aspen *(Populus tremuloides)*. Other extensive areas are wholly denuded of trees, and the rocky, seamed and storm-beaten surfaces are desolate and forbidding in the extreme. Crowning all are naked mountain-crests and snow-clad summits.

Except in a few favored places, the forests are not dense. Compact and heavy growths of Spruce are sometimes found at the highest altitudes, and on the slopes. The Yellow Pine, the most generally useful timber-tree, seeks a lower level than the Spruce, and is usually confined to southern slopes in warm and dry situations. When the pine-forest has been destroyed it is often not reproduced, owing to the prevailing arid conditions. On northern slopes, the home of the Spruce, where snow and moisture are longer retained, a second growth is more likely to appear. The altitudes of the Rocky Mountain region, inclusive of the valleys, plains and plateaus, vary from 680 feet above sea level at Lewiston, Idaho, to 14,400 feet in Colorado. The approximate mean height of the Idaho and Montana ranges is 8,000 feet, of the Wyoming mountains 9,000 feet, of the Colorado and New Mexico system, south to the latitude of Santa Fé, about 10,500 feet. I have thus indicated the great altitude of the region. It extends from the British possessions to the Mexican boundary. At least seven-eighths of its entire area lies north of the latitude of Atlanta. As a result of its high altitude and northern situation, its snowy mountains and extensive forests, powerful rivers have their sources in this region.

During the few years covering the rise of the mountain territories gold and silver mining and live-stock growing have been their chief industries, but agriculture is likely soon to take precedence of the others. Its recent progress, fostered by great systems of irrigation, has been phenomenal. Great agricultural enterprises, similar in kind if not in extent to those of Colorado, have already been started in all of the Rocky Mountain territories. It is obvious that the demand for water, already very great, will be largely increased in the future. The recent action of Congress authorizing surveys to determine what lands of the mountain and plains region may be reclaimed with the aid of irrigation, the water-supply available for such a purpose, and where reservoirs, canals and other irrigation works should be constructed, should receive the closest attention. In view of the agricultural possibilities contingent upon such action, and of the need for the prevention of floods in the great rivers, this movement for the storage and utilization of water is of the first importance.

But what, it may be asked, is the immediate connection between the forests of the Rocky Mountain region and its irrigation systems? The forests are the principal natural agencies in regulating the flow of water. They prevent the premature melting of snows, and protect and nourish the sources of streams. Aside from their office in attracting moisture and causing precipitation, it is evident that these forests, by reason of their location and character, and of the surrounding physical and economic conditions, are of vastly more importance for the conservation of water than for any other purposes.

Railway building in the Rocky Mountain region, and especially in Colorado, offers a most serious menace to the existence of the forests, and it is rapidly increasing. After the tie-chopping legion come settlers, miners, lumbermen and charcoal-burners, all of whom, in addition to their direct havoc of the woods, prepare the way everywhere for fire. For ties only the young, partly grown trees are used, and the consumption for this purpose alone is enormous. And yet cedar and oak ties, from the southern and Pacific forests, can be had in Colorado at a cost not above one-third more than the native pine ties, and they are in every way better and last at least twice as long. Lumbering to supply local and ordinary demands would not, of course, be objectionable if it were properly conducted. Under existing laws, however, most flagrant abuses are perpetrated, and the forests suffer great and unnecessary loss. Mining operations require a great deal of timber, and in some of the older mining districts the supply is exhausted, and such material is brought from a distance at undue cost to the consumer. The charcoal-burner is as merciless as fate. He spares not the smallest growth; nothing escapes him. Smelters consume great quantities of charcoal in the reduction of ores, but it is not necessary, and at some of the principal works little, if any, charcoal is used.

The number of articles which can be manufactured from wood-pulp advantageously is increasing constantly. Pipes made from it and fitted with iron couplings are now recommended for conveying underground all fluids not strongly alkaline, or which are not used at a high temperature. These pipes are impervious to leakage and practically indestructible. They have been used successfully for distributing natural gas, and the non-conductive properties of wood-pulp will make it valuable for underground wire conduits. Vast quantities of Spruce and other trees are destroyed every year in the Northern States and in Canada to furnish the material for the wood-pulp factories and iron-pyrites used in the production of "chemical pulp" are in increased demand. Wood-pulp is imported also into the United States from Sweden and other North Europe countries in very considerable and rapidly increasing quantities.

Recent Publications.

Review of Forest-Administration in British India, for the year 1886-87, by B. Ribbintrop, Inspector-General of Forests to the Government of India, Calcutta, 1888.

It appears from this report, which has just reached us, that the department controlled during the year which it covered 811,824 square miles of forests, or an increase over the amount reported a year earlier of 3,340 square miles. Some idea of the difficulties the Indian forest officers have to encounter appears in the statement that during the year no less than 1,171 cases of prosecution on account of damages of one sort or another were taken to the court, an increase of seventeen per cent. over the previous year. Convictions amounting to seventy-two per cent. of the number of prosecutions were secured.

Much attention is given to protecting the forests from fire, which has always been their most serious enemy. The whole area controlled by the department has not been brought under the fire-protection system, which, however, is being extended as rapidly as practicable. The total area under protection in all the provinces was 20,335 square miles, and of this protected area, 1,644 square miles were burned over during the year, or eight per cent., a result which is considered satisfactory, and shows the enormous difficulty of protecting forests over large areas from fire, especially in the case of forests of coniferous trees. The Indian forest administration has always been hampered by certain rights of pasturage in the forests acquired by the entire population through long custom, and the reserved forests suffer seriously from this cause, especially during dry seasons, when they are called upon to furnish more than usual quotas of pasturage. As an example of the effect of pasturage upon the forest, the case of two compartments in the mountain district of Darjeeling is cited; one field has been closed to cattle during a period of twelve years, while the other had been pastured during the same period. Seedlings and young trees abound in the former, while in the latter young trees or saplings are very rare, and no seedlings exist.

The following extract refers to Bombay, and is worth careful consideration on the part of the Commission of the Adirondack forests, who recommended the expenditure of considerable sums of money in planting trees upon the exposed rocky hills in the northern part of the state:

"The Conservator of the Northern Circle speaks very hopefully of reproduction in all forests where fires and cattle are excluded, and notices that the general experiment in the state of the reserves has been commented upon very frequently by outsiders, and this with special reference to hills which were formerly bare, but are now gradually covering over with a bushy vegetation, the advance guard of a higher order of plants. He expresses his conviction that the forest department could, by simple and inexpensive means, restore timber to all the bare hills of the Deccan, provided that fires and cattle are excluded, and the work of natives not interfered with in an irrational manner."

The gross revenue during the year covered by this report reached a total of $5,016,000, which is the highest figure yet arrived at by the department. The net profits, however, fell slightly below those of the previous year, although the net revenue per square mile of forest increased from $8.80 to $9.24. The expenditure of the department includes the formation of new plantations covering 3,939 acres, and the cultivation of 39,924 acres of plantation made previously.

Periodical Literature.

In *Harper's Magazine* for February Mr. John Habberton writes sympathetically and encouragingly of "Bulb Gardens In-doors," explaining the charms of Hyacinths, Tulips, Narcissus and kindred flowers, and discussing their relative claims upon the amateur's attention. Many of his hints and counsels are very useful, and his enthusiasm, evidently based on successful personal experience, ought to encourage his readers to enter upon what is certainly the most satisfactory branch of house-gardening. We must, however, take issue with him when he recommends double Tulips as better than single varieties for in-door gardening. He is doubtless justified by practical considerations. The single Tulip, as he points out, is apt, when grown in this way, either to fail to develop its form in perfection or to lose it soon after it has been attained. "The double Tulip, with several times as many petals, proves that in 'union is strength' by retaining its form much longer." But when he adds that "there is little or no choice between single and double varieties as to beauty and range of color," he is surely misleading—that is to say, if by "beauty" he means the form as well as the color of the flower. In all flowers of this character beauty of form is the most characteristic quality, and to double a Tulip, a Narcissus or a Hyacinth is to decrease its value in the eyes of the true lover of floral beauty to an almost incalculable degree. Who would not be shocked by the idea of a double Bermuda Lily or Lily-of-the-Valley? Yet the form of a well-grown Tulip is almost as beautiful, and quite as insistently demands respect at the hands of the horticulturist. With Roses the case is different. Some florists' Roses, indeed, are, like double Tulips, mere showy, formless masses of crowded petals. But in others—as in the best varieties of Tea Roses—while the exquisite simplicity of the form of the wild single Rose has been lost, a new type of form as beautiful in its own way in every stage of growth, and much more sumptuous and superb, has been achieved. The fact that the difference between double Roses in this respect is so often ignored both by cultivators and by purchasers speaks badly for the condition of public taste, but by no means excuses the praise too often given to double flowers. One glance at the exquisite drawing by Mr. Hamilton Gibson of a single Tulip and a single Daffodil, which helps to illustrate Mr. Habberton's article, should prove to the reader the folly of tampering with forms that Nature has made so perfect. If single Tulips cannot be well grown in-doors, let double ones be accepted as a makeshift. They can be nothing more than this, for even beauty of color suffers when the petals are so crowded together that their delicate streakings and shadings cannot be clearly discerned. All of Mr. Gibson's drawings, as one might expect, are very charming, and if the most important among them—the "Window Garden"—shows a result of such ideal beauty that few people can hope to reproduce it in their homes, it is well that enthusiasm and vigorous effort should be excited by a realization of what the best success may mean. The little drawing of *Freesia refracta alba* is particularly pretty.

Correspondence.

The Mistletoe.

To the Editor of Garden and Forest:

Sir.—I clip the following from an English horticultural journal: "The orchards of Worcestershire supply large quantities of the interesting parasite (Mistletoe), and though considered by some difficult to grow, it is not so. The way to propagate it is to obtain the berries, choose a suitable tree—Apple for preference—select a gnarled bough, and press in the berries in a notch where birds are not likely to pick them out, or cut a slit on the under side of the branch for the reception of the seed. Many an amateur who has an orchard cultivates his own Mistletoe, and a tree with the plant growing amongst the branches is exceedingly picturesque."

Will you kindly tell me whether the Mistletoe can thus be cultivated in America, and how far north it is hardy? Year by year at Christmas time there is a demand for it in our large cities, but the supply is small, and purchasers are often displeased with what they get, as it has a withered appearance in both the leaves and the fruit. This appearance is occasioned, I am told, by packing and transportation from distant places, and I think perhaps American amateurs or tradesmen might do well to grow it for themselves, if the thing is feasible.

Watertown, Conn. *F. R. D.*

[The American Mistletoe (*Phorodendron flavescens*) is found from southern New Jersey to southern Illinois, and southward. It appears to be most common in some parts of Kentucky and Tennessee, where it does considerable damage to various trees, notably the Black Walnut, which is often killed by the excessive multiplication of the Mistletoe upon its branches. It is not known that any attempt has been made in the United States to cultivate the Mistletoe.—Ed.]

Poison Ivy.

To the Editor of Garden and Forest:

Sir.—Gray, in his "Manual of Botany," fifth edition, under *Rhus Toxicodendron*, L., Poison Ivy, Poison Oak, says the entire leaved form is *R. radicans*, L. Wood's Class-Book of Botany, 1875, separates the species into *R. Toxicodendron*, L., Poison Oak, Poison Ivy, and *R. radicans*, L., Climbing Ivy.

It seems to me that the division of these forms into species is eminently proper, if one may be permitted to generalize from a local herborization. So far as I have observed, *R. Toxicodendron*, with rhombic-ovate, variously notched, sinuate or cut-lobed leaves, is virulently poisonous. *R. radicans*, which

is either a low shrub, or a climber by rootlets over rocks and ascending trees, but with always entire leaves, is either not poisonous or else little virulent. The knowing this distinction in properties and this relation of forms may bring comfort to those who would otherwise live in a condition of timidity.

Along the shores of Buzzard's Bay *R. radicans* is excessively abundant. At Nonquitt it forms dense, low thickets about a tennis-court, occurs in the scrub growth about the cottages, along various paths frequented by nurses and children, about the play-grounds along the shore, and in the woods, climbing trees to a height of many feet, and with a stem of over an inch in thickness. In playing tennis the balls often fall amidst its growth, and are recovered by ladies and children indiscriminately, but I have yet to learn of a case of poisoning. The children ramble at all times amidst its growth, and remain unpoisoned. Those who are especially subject to Ivy poisoning in regions where *R. Toxicodendron* is the leading form, at Nonquitt last summer escaped poisoning altogether, although often fearful on recognizing contact with the dreaded plant.

Although perhaps the specific differences, as usually considered by botanists, are scarcely sufficient to separate these two forms (although I have noted no intermediate or connecting forms), yet this one difference in quality (or quantity?) would render it desirable to recognize in our manuals and local floras these two forms *as if* distinct.

South Framingham, Mass. *E. Lewis Sturtevant.*

"When to Employ the Landscape-Gardener."

To the Editor of GARDEN AND FOREST:

Sir.—May I add a postscript to your recent editorial? It is not long since the American public first began to give thought and money to securing well-designed houses. We had first to realize that our dwellings were not what they might be, and, secondly, to learn that if we would do better we must ask the help of men specially trained to design happily and to build well. As respects the surroundings of our houses, even most of us who have employed architects are still in the first or unawakened stage. We simply have not perceived that our surroundings might be pleasanter or more in keeping with our abode. While we spend freely to fill the house with things of beauty, we probably leave the spaces round about it wholly bare, or if we attempt something better than nakedness, we do so without thought of general effect—without regard to any such principles of design as guided the architect in his shaping of the house. Not until we come to see that the surroundings of the house as well as the house itself should be designed—that house, approaches and surroundings should be planned together—shall we be likely to call upon the landscape-gardener.

Boston. *Charles Eliot.*

Recent Plant Portraits.

PSEUDOPHŒNIX SARGENTI, *Revue Horticole*, December 16th; a reproduction of the figures published in GARDEN AND FOREST, vol. i., pp. 353 and 355.

RODRIGUEZIA FRAGRANS, *Gardeners' Chronicle*, December 29th. "This Brazilian Orchid is an old inmate of our Orchid-houses, and best known under the name of *Burlingtonia fragrans*. Its delightfully fragrant white flowers, with yellow centres, are grateful everywhere, but from the neat habit of the plant it is especially acceptable in collections where the space is limited and the house is small. Like the rest of the genus, it thrives best and is safest in baskets suspended near the glass of the roof, and after the pseudo-bulbs are fully matured it should be carefully but sparingly watered, sufficient only being given to keep it plump and healthy. During its inactive season, a place near a ventilator in the Cattleya-house, in which it is growing, or in some other part of the house, where there is a good air, not too heavily charged with moisture, assists in ripening its growth."

SYMPHYANDRA HOFFMANNI, *Gardeners' Chronicle*, December 29th; a native of Bosnia, where it was discovered in 1883; a free-blooming, hardy plant of the Campanula family, with white flowers, and well worth a place in the garden. The figure is from a plant which flowered for the first time in England in the Royal Gardens at Kew.

PINUS COULTERI, *Gardeners' Chronicle*, December 29th.

ECHINOCACTUS TEXENSIS, *Gartenflora*, December 1st.

ZYGOPETALUM SANDERIANUM, *Gartenflora*, December 15th.

CATTLEYA RŒZLII, *Revue Horticole*, December 16th.

Public Works.

The Legislature of Minnesota having been petitioned to set aside a certain piece of ground for the purposes of a state park, the matter was referred to a committee consisting of Mr. H. W. S. Cleveland and Mr. J. D. Ludden. The following is a brief abstract of the report, which will be read with interest by all persons who look upon the preservation of natural scenery as a matter of real public importance:

After careful examination of the subject and consideration of future issues and interests involved, we have arrived at conclusions which can only be appreciated by a statement of the conditions which have led to the result. The Mississippi River, between St. Anthony Falls and the mouth of the Minnesota River, flows between high and precipitous banks, which are intersected at irregular intervals by deep transverse ravines, forming the beds of brooks. The largest of these is the valley of the Minnehaha, which is the outlet of the chain of lakes of which Minnetonka is the head. The others are simply the water-sheds of adjacent uplands. The character of the whole region is picturesque, and the effect of its topography is increased by a luxuriant growth of trees. It is yet possible to preserve nearly the whole of this historic region, and we appeal to the state of Minnesota, for its own honor and its own interest, to follow the example of the state of New York in the preservation of the Adirondacks and Niagara Falls, and to secure the whole area to be forever preserved. We ask that an area on the east side of the river extending from the grounds of the State University, or as near that point as possible, to a point opposite the lower end of Pike Island, and on the west side, from Riverside Park to the military reservation at Fort Snelling, and of such width on each side as will include the natural features of the banks and ravines, be secured as the property of the state, and that the whole intermediate space, including the river and its islands, shall thenceforth be preserved as public domain, connecting, as it necessarily and appropriately would, with the park systems of St. Paul and Minneapolis, and forming in itself a park of such unique character, comprising such features of grand and picturesque natural scenery as could nowhere else be rivaled. A broad avenue should extend for the whole length of each tract on the side farthest from the river, and the cost of these avenues, as well as the improvement of the park itself by diverging roads or paths to points of interest, should devolve upon the cities to which they respectively pertain.

The Park Board of this city passed a resolution at a recent meeting to set apart, in one of the new parks, sufficient ground for a botanical garden, if the friends of that enterprise should raise an adequate amount of money for its endowment within a period of two years. It is said that the Park Commissioners have good reason to hope that public spirited citizens stand ready to contribute the necessary funds if the garden can be established under an administration similar to that of the Museum of Natural History and the Museum of Art.

Notes.

The ninth edition of Mr. William Paul's well-known book on Rose-culture—"The Rose Garden"—has just been published in London.

Mr. E. S. Goff, horticulturist of the New York Experiment Station, has accepted the professorship of horticulture in the University of Wisconsin.

The average number of persons who have visited the Museum of Natural History in this city on the evenings when it has been open has exceeded 1,000.

Iris reticulata is now being forced near New York for the Easter trade. There is no reason why it should not be a success, though its capabilities in this direction are as yet untested.

A species of Phylloxera has been injuring Pecan trees in Mississippi. Dr. Riley has not identified it with any known species, but it is closely allied to a Hickory plant-louse named by Dr. Fitch *Phylloxera caryæcaulis*.

Of the newer grapes, Moore's Diamond was commended at the late meeting of the Western New York Horticultural Society for vigor of vine, productiveness, good quality and earliness. The Moyer and the Mills were highly spoken of.

A new white Rose is The Queen, a sport from Souvenir d'Un Ami. It will hardly supplant The Bride and Niphetos, in the trade at least. Apart from its fragrance it will not compete with The Bride, which many growers declare their most profitable Rose.

The double-flowered Chinese Blackberry has been forced successfully this winter, producing wreaths of white blooms about two inches across, which bear a strong resemblance to Polyantha roses. It is easily grown, but requires too much room in a green-house to pay the commercial grower.

The Rocky Mountain Columbine (*Aquilegia chrysantha*), which has been somewhat neglected of late, is now being grown largely with a view of bringing its merits before the public. It is a very handsome perennial, one of the handsomest of its tribe, and an admirable plant for the rockery or herbaceous border.

Houghton, Mifflin & Co. are to publish the miscellaneous scientific papers of Asa Gray, which are being selected and arranged by Professor Sargent. The first volume, containing the reviews of works on botany and related subjects, written between the years 1836 and 1887, is now in press, and will appear early in the spring.

A specimen of the Californian *Pinus Sabiniana* growing in isolation on a lawn in the Botanical Garden at Kew now measures thirty-five feet in height, and at four feet from the ground girths five feet six inches. From an illustration of it recently given in the *Gardeners' Chronicle*, it seems to be a symmetrical and beautiful specimen.

Many trees in western Massachusetts were broken down by the formation of ice on their branches during a rain-storm on the 6th of January. A correspondent writes that in some cases every twig was encased in ice half an inch thick. Accurate weighing of one of the broken branches in the village of Ashfield Plain showed that there were fourteen pounds of ice to one of wood.

The material benefit which French conquest has conferred upon Algeria shows clearly in accounts of the extent to which systematic irrigation has already increased the cultivable area of the country. In the district called the Oued Rir, the once-fertile oases had been almost buried under desert sands when the French took possession; now, by means of irrigation systematically carried out with the water of the native wells and of numerous artesian wells that have been sunk, these oases have been reclaimed to the number of forty-three, and are estimated to bear 520,000 Date-palms and 100,000 other fruit-trees which already produce profitable crops. The population of the district has meanwhile doubled, while its condition is vastly more prosperous than before.

A correspondent of an English horticultural journal writes that the thick fogs which recently spread over the neighborhood of London did serious damage to hot-house plants. "Before the fog came we had cut some six dozen good flowers (from a plant of *Camellia alba*), but not one since; nor are we likely to do so again; for although the trees were nicely set with buds and half expanded flowers at the time the fog set in, all of these turned rusty and fell off. . . . A plant next to it—a red variety well set with buds—has so far passed through the ordeal without loss of buds or flowers. Amongst Orchids the Calanthes show no ill effects. . . . A plant of *Saccolabium giganteum*, with two spikes of flowers on it, suffered injury at the ends of the trusses, where the flowers were not fully open, all of them turning to a brown color and having to be cut off. Azalea Indica, white and colored—a few of which were gently forced—have withstood the fog well."

The largest artificial cascade ever planned is doubtless the one which was partly built in the grounds of Wilhelmshohe near Cassel, the summer residence of the local dukes, but better known in our time as the place where Napoleon III. was confined after the battle of Sedan. The park is a large and fine one, with very beautiful Beech-woods and many passages of the most charming natural scenery. But it likewise includes a make-believe mediæval castle and many singular devices. The cascade was begun in the first years of the last century, and was intended to consist of a series of regular steps leading down the whole side of the mountain upon which the park was created to the vicinity of the castle below. The plan proved too ambitious for accomplishment, and only the upper part of the cascade was built, the steps starting from a statue of Hercules, which is thirty-six feet in height, and into the head of which visitors may ascend to spy out the landscape, literally through the giant's eyes. Yet though this completed portion is only a third of the whole, it measures 800 feet in length, the steps gradually widening as they descend between masses of forest verdure.

In the latest Bulletin from the Iowa Experiment Station, Mr. R. P. Speer points out certain structural differences which are said to exist between such Apple trees as Duchess of Oldenburg, Letofsky and a few other varieties from Russia which have endured the trying climate of the North-west, on the one hand, and the ordinary American Apples and those from west Europe on the other. The flowers of the former have larger and thicker petals, shorter and more stocky pistils and stamens, larger stigmas, anthers and pollen grains; their leaves are thicker; their wood, bark and bud-scales have a finer texture; and their roots penetrate more deeply beyond the frost-line. These physical peculiarities of the hardy trees are protective against summer drought and winter cold. Having been developed in a region of short summers, they ripen their wood early, their cambium layers do not contain so much liquid, and are, therefore, less subject to scalding of the bark on the south-west side when freezing temperature quickly follows warm weather in early spring. The questions suggested by these studies are interesting, and it is to be hoped that further investigation will enable Mr. Speer to give more definite facts in support of his theory.

In a recent number of the *American Florist* are printed trade reports with regard to holiday sales of flowers from forty-seven towns in the United States. In almost all cases the report is satisfactory in so far as quantity is concerned, though there are numerous complaints about the quality of the flowers as having been affected by unfavorable weather. In many places the demand for the costliest kinds of Roses seems to have been very large, while in others the cheaper kinds of flowers were in greater requisition. The trade in Christmas trees and in greens for church decorating is evidently increasing from year to year, and the finer greens—Holly especially—are more and more in demand. But the most interesting fact to be gathered from these reports is that the public is turning away from baskets and set pieces and learning to prefer boxes of loose flowers, which may be arranged at home. "Four-fifths of the call was for loose flowers," writes one correspondent; "A notable decrease in the demand for baskets and bouquets," writes another; a third "The demand for loose flowers exceeded everything; but few baskets were made up," and a fourth, "The demand for baskets is yearly on the decrease," while thirty-four reports out of the forty-seven include similar statements, and only four speak of an increased demand for set pieces. Had the holiday trade, as a rule, been bad, these changes might be explained by the fact that a reasonable quantity of cut flowers may be more cheaply purchased than even a small basket arranged by the florist. But as things have stood this year they seem to denote a growth in good taste and in the appreciation of the true beauty of flowers, which is indeed of promising import.

Mr. Sylvester Baxter, who is contributing an interesting series of letters on "Archæological Campaigning in Arizona," to the *American Architect and Building News*, speaks as follows of the neighborhood of Las Acequias, where Mr. Cushing is now pursuing his explorations: "The new camp is pitched in a pretty little hollow amid a clump of old Mesquite trees. The hollow is that of one of the ancient reservoirs and the moisture retained there makes it a favorable place for the luxuriant growth of the Mesquite trees. . . . The name conferred on the ancient city, Las Acequias, comes from the great irrigating canals that spread out fan-like among the ruins, and reach away to various parts of the plain to supply the other cities of the group. . . . It must have been an enormous labor to excavate them in those times, with nothing but crude stone implements and baskets for the transportation of the earth." When emigration sets in "the landscape undergoes a rapid transformation in the course of a few weeks. . . . The Mesquite trees are cut down and burned in piles above their roots, whose ramifications are followed by the smouldering combustion, leaving the ground ready for the plow, when that instrument shall eventually be brought into requisition, which will probably not be for two or even three years, for the mellow, rich soil needs no plow at first. A seed-drill rapidly sows the grain when the ground has been cleared, and the only labor then required is to irrigate and harvest. The next year even the labor of sowing is unnecessary, for a luxuriant volunteer crop springs up from the self-sown, ripened grain, and often, the second year, there is still another volunteer crop as abundant as the first! The growth of Sage-brush or Greasewood is cleared off with slight trouble or cost; a stout bar or beam is dragged across the land by a pair of horses, one attached to each end. The bushes are displaced by the powerful leverage at their bases as the beam is dragged over them. The team then follows the same course in a reverse direction, either yanking up the bushes by the roots or breaking off the brittle wood close to the ground. The brush is finally gathered into great piles and burned, making a strong, clear flame that shows across the country for a great distance."